Klamath River Basin
Fish Kill Response Plan

Klamath Fish Health Assessment Team
(KFHAT)

August 2005

INTRODUCTION

The Klamath Fish Health Assessment Team (KFHAT) is a technical workgroup which formed during the summer of 2003 with the purpose of providing early warning to avert and/or a coordinated response effort to respond to a fish kill event in the anadromous portion of the Klamath River Basin (below Iron Gate Dam) such as occurred in the Fall of 2002. To accomplish this goal, KFHAT created a network through which information about current river and fish health conditions in the Klamath Basin can be quickly shared among participants, the general public, and resource managers. The timely dissemination of information on river conditions from a technical workgroup such as KFHAT to resource managers and other policy makers is imperative for rapid and well-informed decision-making. In addition to information sharing and coordinating response efforts, KFHAT members are attempting to better understand the specific conditions and warning signs which may lead to a fish kill in the Klamath Basin. The group recognizes that adult and juvenile fish kills affect the overall viability of salmon populations in the Klamath Basin and that managing controllable factors associated with water storage, use, and distribution may ameliorate conditions that result in fish kills.

What is KFHAT?

KFHAT was initiated by the North Coast Regional Water Quality Control Board in the summer of 2003 and is made up of agencies, tribes, private organizations, and other interested individuals that share a concern for fish health in the anadromous portions of the Klamath Basin. Attendees have included representatives of the following:

- California Department of Fish and Game
- Hoopa Valley Tribe
- Humboldt Watershed Council
- Karuk Tribe
- Klamath Salmon Anglers and Guides Association
- National Oceanic and Atmospheric Administration Fisheries (National Marine Fisheries Service)
- North Coast Regional Water Quality Control Board
- PacifiCorp
- Quartz Valley Tribe
- Salmon River Restoration Council
- U.S. Bureau of Reclamation
- U.S. Coast Guard
- U.S. Environmental Protection Agency
- U.S. Geological Survey
- U.S. Fish and Wildlife Service
- U.S. Forest Service
- Yurok Tribe

Goals of the Klamath River Basin Fish Mortality Response Plan

The purpose of the Klamath River Basin Fish Mortality Response Plan (Response Plan) is to develop an effective Response and Monitoring Network (RMN). This network of professional aquatic scientists will be mobilized in a timely manner to evaluate fish health problems, mortality, and associated causes throughout the Klamath River mainstem and tributaries. The Response Plan does the following:

1. Establishes readiness levels
2. Serves as an initial guide for response to fish kill events
3. Identifies participants of the RMN and lead agency responsibilities
4. Provides guidelines for documenting the magnitude and extent of the event
5. Provides guidelines for information sharing with resource managers
6. Provides guidelines for data responsibilities and post-event analysis and reporting.

INFORMATION SHARING

In order to determine the cause of a fish kill it is necessary to collect background information or baseline data on water quality, hydraulics, meteorology, fish behavior, and fish pathology. Normally these data are collected at varying time scales and locations for purposes other than fish kill surveillance. Each of these data sources involves varying degrees of quality control and assurance. Some of these monitoring efforts may ultimately serve as warning indicators or may trigger response action, especially if the data are reported in near real-time.

There are multiple agencies/organizations throughout the Klamath River Basin, many of whom are participants of KFHAT, measuring or monitoring various water quality parameters, hydrology, fish immigration/emigration, fish health, and more. Some of the data collected in these efforts may indicate deteriorating conditions and may warn of increased risk of a pending fish kill. These data can even provide the framework for monitoring various attributes in the event of a kill.

The KFHAT works with investigators throughout the basin to identify the most useful indicators of fish health and water quality that are currently being monitored, and foster real-time or near real-time data sharing. As needed, KFHAT will identify ways to improve the usefulness of ancillary monitoring efforts to assess environmental conditions related to fish kill risk, and will work with cooperating entities to identify data needs and add or modify investigations as needed.

Readiness Levels

Existing information being collected throughout the Klamath Basin will be used to determine the current conditions in the Klamath River and its tributaries. The following four level system of readiness will be used to communicate these conditions and the associated level of threat among KFHAT members, resource managers, and the public. Baseline data and information on river conditions are not yet fully developed so evaluation of changes in river conditions and the associated readiness level will be based on the best professional judgment of KFHAT members utilizing the currently available data.

1. **Green**
   - River conditions appear satisfactory, fish appear healthy, no immediate problems foreseen
   - Frequent data sharing is not as crucial at this level, but continue to observe and document conditions
2. **Yellow**
   - Conditions, such as unfavorable physical or chemical conditions, observation of increased incidence of pathogens, or increased fish morbidity and/or mortality suggest the need for heightened awareness
   - Frequent data sharing among KFHAT and resource managers becomes important
   - The Response Plan procedures should be reviewed and responders should be ready to take action if the situation worsens
3. **Orange**
   - A kill is likely to occur and management levels in agencies need to be alerted
   - Frequent data sharing among KFHAT and resource managers is vital
   - If possible, KFHAT will provide recommendations for resource management actions to management with basis for recommendations
4. **Red**
   - A fish kill is occurring or imminently expected

- Frequent data sharing is crucial and relies on quick and accurate information exchange by phone with follow-up documentation
- The Response Plan is fully implemented
- Immediate management actions may be needed to avoid further mortality

PROCESS AND PROCEDURES FOR FISH KILL EVENTS

"A fish kill is defined as any event involving increased fish mortality over and beyond background levels (AFS 2003)". The term "fish kill" does not include natural spawning mortality or incidental fishing mortality. A fish kill is usually associated with unusual circumstances, which can be understood only after consulting with experienced biologists. It often requires resources beyond existing monitoring personnel in order to determine the causes of mortality and document the associated damages.

Fish kill events in the Klamath Basin can be highly variable in intensity, geographic scale, and cause. As such, this Response Plan is intended to serve as a general guide and does not contain exhaustive specifics on sampling techniques and protocols. Instead, this Response Plan initiates team discussions where procedures for field response are finalized prior to deployment in the field. Additionally, this Response Plan identifies, by geographic area, lead agencies responsible for coordinating fish kill response. Responders should refer to American Fisheries Society Special Publication 30: *Investigation and Monetary Values of Fish and Freshwater Mussel Kills* for specifics, and crew leaders should have fish kill response training.

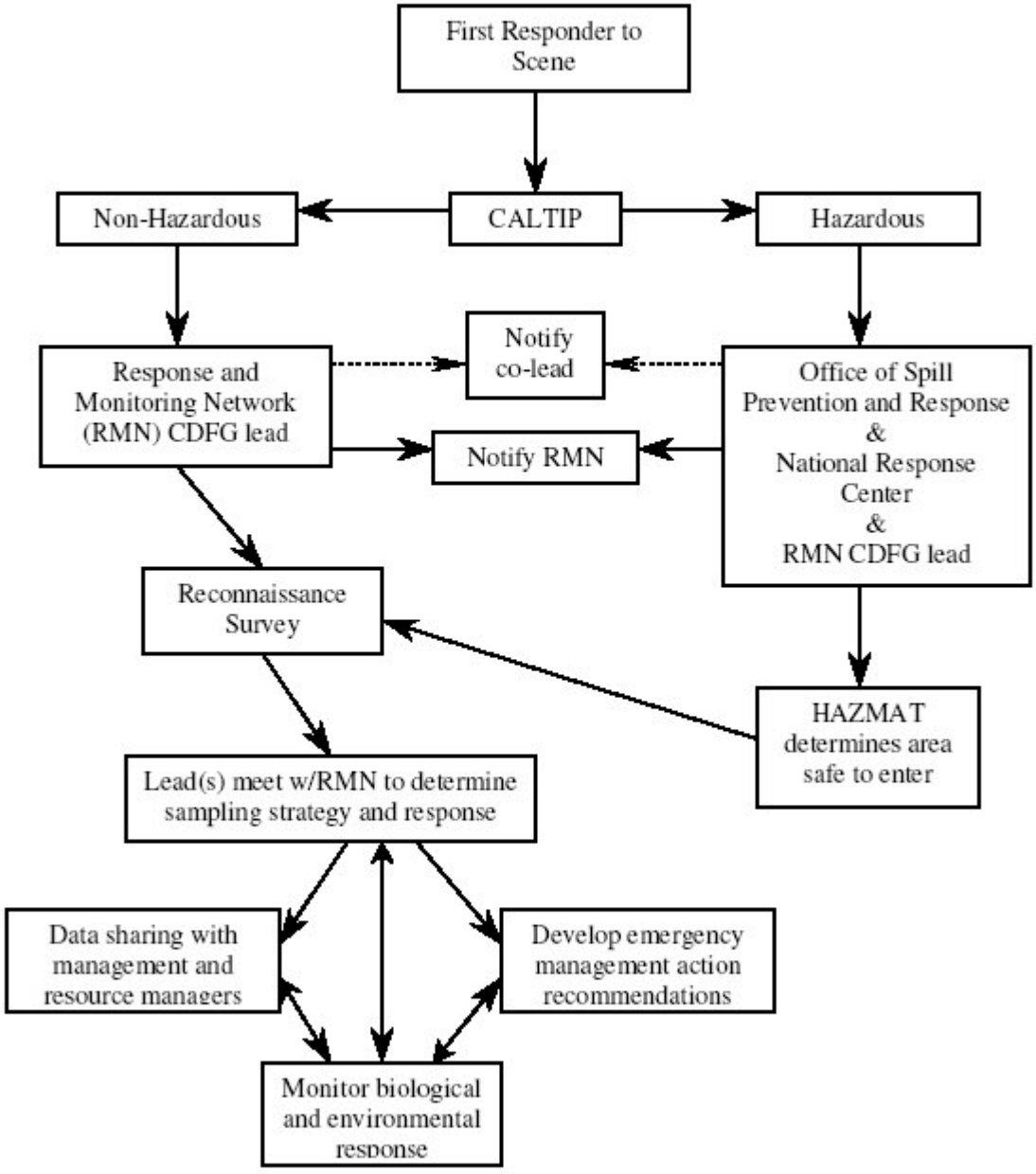
The response procedure for both non-hazardous and hazardous materials related fish kill events are shown in Figure 1.

Response to Non-Hazardous Materials Related Fish Kill Events

If a fish kill does not appear to involve a hazardous material release or oil spill, the following process should be implemented.

1. First on scene notifies CalTIP
2. CalTIP notifies the lead RMN from CDFG
3. CDFG will then notify tribal co-leads (when applicable) and the RMN
4. The geographic lead initiates reconnaissance immediately
5. The geographic lead meets with RMN members as soon as possible to share reconnaissance findings, formulate sampling strategy, and initiate monitoring and response
6. Real-time data sharing will occur with management and resource managers
7. If possible, informed recommendations for emergency management actions based on preliminary findings or based on indicators from continuous monitoring will be developed.
8. Monitor biological and environmental response to emergency management action(s), if implemented

Figure 1: Fish Kill Response Tree



Response to Hazardous Material Related Fish Kill Events

Regulatory jurisdiction for containment, clean up, and mitigation for spills of hazardous substances belongs to the State, U.S. Coast Guard, U.S.EPA, Tribes (on tribal lands), and/or land management agencies. Those responses and authorities are outside the purview of KFHAT and are not described in this document. Field investigators associated with this RMN SHOULD NOT enter the scene of a fish

kill if the presence of hazardous materials is suspected until appropriately trained and equipped hazardous materials (HAZMAT) investigators have deemed the area safe. However, this network will be useful to document the severity and extent of a fish kill caused by a spill once it has been appropriately determined safe to enter the field and conduct the necessary surveys.

The following process should be used for response to a fish kill potentially caused by a hazardous spill.

1. First on scene notifies CalTIP
2. CalTIP notifies Office of Spill Prevention and Response, and National Response Center
3. CalTIP notifies the lead RMN from CDFG
4. CDFG will then notify tribal co-leads (when applicable) and the RMN
5. The geographic lead communicates with HAZMAT responders, and organizes and conducts initial reconnaissance when it is safe to do so
6. The geographic lead meets with RMN members as soon as possible to share reconnaissance findings and begin sampling strategy discussions
7. Once HAZMAT responders determine that the area is safe to enter, initiate monitoring and response
8. Real-time data sharing should occur with management and resource managers
9. If possible, develop informed recommendations for emergency management actions based on preliminary findings or based on indicators from continuous monitoring. (HAZMAT responders may develop emergency management action recommendations independent of this RMN. It is NOT the intention of KFHAT to hinder those recommendations, if made)
10. Monitor biological and environmental response to emergency management action(s) if implemented

Initial Response of Participating Investigating Agencies

This Response Plan recognizes that sampling techniques and protocols should be tailored to specific events and relies on immediate initiation of reconnaissance-level surveys and response team discussions coordinated by the lead agency (determined geographically). Except in the case of very localized and relatively minor fish kills where reconnaissance responders might be able to fully characterize the event, team discussions must occur to finalize procedures and sampling strategies prior to field deployment. Ideally, first responders would include members with expertise from each discipline (water quality, fish health, and sample design for carcass enumeration). Field data sheets for fish enumeration, water quality data collection, and a USFWS dichotomous key for fish kill investigations can be found in Appendices A-C. Bottle kits that contain water quality sample bottles to be used in the event of a fish kill have been distributed along the Klamath and Trinity Rivers at the following locations:

- Klamath, Yurok Tribe (5 kits)
- Orleans, USFS (1 kit)
- Happy Camp, USFS (1 kit)
- Iron Gate, CDFG Hatchery (1 kit)
- Willow Creek (1 kit)

Responders should refer to American Fisheries Society Special Publication 30: *Investigation and Monetary Values of Fish and Freshwater Mussel Kills* as a comprehensive guide for responding to a reported fish kill. At a minimum, the following attributes should be investigated and recorded for use in the RMN sampling discussions will to immediately follow reconnaissance:

- Water color/odor/clarity
- Is there an obvious point-source for any contaminant that may have caused the kill?
- Species/life stages that appear to be affected
- Note any perceivable affect on macro-invertebrates
- Upstream and downstream limits of fish kill
- Note behavior and condition of live fish if any
- Does the kill appear to still be ongoing or are remaining live fish unaffected?
- Try to get a preliminary idea of the densities of dead fish and variability by potential strata for sampling strategy discussions (shoreline, bottom, floating, etc)

As soon as possible after reconnaissance, the lead responding agency will convene sampling discussions with other RMN participants. Sampling strategies, roles, and responsibilities of each participating agency should be clearly defined in these early discussions. Communication should be maintained with all participants throughout the investigation and the participants should meet regularly or participate in conference calls to discuss progress/results/solutions. The frequency of RMN meetings will be determined by the circumstances surrounding the fish kill and will be event-specific.

Notification Process and Zones of Lead Responsibility

All fish kills should be reported immediately to the California Department of Fish and Game's CalTIP number: (888) 334-2258. CalTIP will notify a local CDFG warden who will investigate the situation and contact the lead RMN coordinator from CDFG. When applicable, CDFG will then notify the tribal co-lead as indicated in this document (map Appendix D) through the phone tree provided in Appendix E. California Department of Fish and Game will serve as the lead response agency for all fish kills within the basin and will serve as the co-lead on fish kills that occur on Tribal lands.

For fish kills that occur on Tribal lands the following Tribes along with their geographic area of responsibility will serve as co-lead coordinator:

- Yurok Tribe – Mouth of the Klamath River to Aikens Creek
- Karuk Tribe – Aikens Creek to Seiad Creek
- Hoopa Tribe – Trinity/Klamath confluence upstream to Tish Tang Creek

Upon notification of a fish kill, the lead coordinating agency or tribe will be responsible for notification of other members of the RMN using the contact list in Appendix F. This contact list is not intended to be widely distributed. The individuals on the contact list represent their organization on KFHAT and/or can mobilize RMN resources within their organization to respond to a fish kill within anadromous portions of the Klamath Basin.

The CalTIP phone number should be widely advertised through the use of the posters in Appendix G, which should be posted and distributed at public fishing and boating access points and campgrounds. There are also numerous agencies and organizations conducting ancillary studies throughout the basin, and the CalTIP number should also be advertised among those agencies and their field personnel. The fish kill notification process is simplified by using CalTIP as the initial notification, and will reduce confusion among public river users and agency field personnel who are most likely to be the first to encounter a kill.

Identify REACTIVE emergency management actions

If a fish kill is occurring or appears imminent, based on the judgment of KFHAT members, KFHAT should meet or teleconference as soon as possible to discuss current findings, determine protocol for the reconnaissance, and determine monitoring strategies. If specific, scientifically based actions can be identified that have the potential to reduce, alleviate, or prevent the fish kill, KFHAT should inform the appropriate resource management agencies. In order to make informed recommendations, participants in these efforts will likely need to have near real-time data from the affected area at their disposal – timely data sharing will be crucial. Representatives from the management agencies that might be called upon to provide an emergency action should be asked to participate in these discussions as early as possible.

If an emergency action is recommended, KFHAT participants should develop a monitoring plan to quantitatively characterize response to the emergency management action (change in water quality, fish density, fish health, fish migration, etc). Empirical data gathered from such emergency events should be used whenever possible to contribute to the understanding of the relationships of management actions to fish health, fish migration, water quality, etc. Results from these actions and monitoring efforts can influence or form the basis for future response actions.

Incident Command System

Depending on the extent and severity of a fish kill, elements of the Incident Command System (ICS) will be used by the lead response entity. This system employs a Command Post with joint command and primary functions for safety, public information, and liaison to agencies and other support. The Command Post relies on four primary functional areas to coordinate activities: operations (what is being done), logistics (how to get it done), planning (what happens next, contingencies, supplies, etc.), and finance (keeping track of expenses, how to pay). Any or all of these may be appropriate for a fish kill response. One of the first determinations by the lead entity is to determine if ICS should be used and what elements are appropriate, and to review that as the response proceeds. Basic structure is provided in Appendix H.

Safety

First responders to a fish kill of unknown origin should treat the scene as if there were hazardous substances present. It is strongly encouraged that field staff responding to fish kills have hazardous substance safety training. If a hazardous material spill appears to be associated with a fish kill DO NOT enter the scene unless properly trained and equipped. Move to an uphill and upwind location and contact California Department of Fish and Game's CalTIP number: (888) 334-2258 and ask them to contact Office of Spill Prevention and Response (916-445-9338), and National Response Center (800-424-8802) for HAZMAT assistance. Defer to HAZMAT experts for determination of when it is safe to enter the scene. Some identifying characteristics of a hazardous or toxic spill are:

- An over-turned vehicle, leaking drum, or other discharge
- Any chemical or petroleum type odor, or reports of such an odor
- Any reactions by people in the vicinity, including, but not limited to
    - excessive tearing
    - excessive perspiration or inability to perspire normally
    - any eye, skin, nose, mouth, or lung irritation
    - dizziness, blurred vision, numbness or any changes in the senses

- multiple species affected, including riparian vegetation and terrestrial insects
- bleaching of aquatic vegetation and substrate

Other training, including first aid and swift-water rescue, is highly recommended. Each agency is individually responsible for ensuring all participating personnel have the appropriate safety training and personal protection equipment. Life vests should be worn by all personnel during any boating operation. First aid kits should be carried by all survey teams. Mobile phones and radios are strongly encouraged. Upon mobilization of a response team, a Safety Officer will be designated per the Basic Incident Command Structure depicted in Appendix H. At a minimum the Safety Officer will set up checkout and check-in procedures to keep track of the teams and be able to initiate a rescue operation if needed.

Media Relations

Media Relations should be handled primarily by the agency with overall coordination duties. Joint media releases that contain mutually agreed points is encouraged.

Data Responsibilities

Each responding organization is responsible for the quality of data it provides to this effort. The usefulness of any data provided will ultimately depend on its accuracy, vigilant documentation of its collection and quality assurance/quality control (QA/QC) procedures, and accurate description of any post-processing or analysis. Certain KFHAT participating organizations possess particular expertise that lend themselves well to assuming responsibility for coordinating collection of certain types of data and to serve as a central point for maintaining the data provided by all participants. Without subverting the role of geographically identified lead responding agencies, Table 1 below describes suggested leads for various disciplines.

Table 1: Response and Monitoring Network responsibilities - by discipline.

Agency	Overall Response Coordination and Final Report	Carcass Enumeration	Water Quality	Fish Health
NCRWQCB	NA	Assist as needed	Lead - all non-tribal lands, technical assistance on tribal lands	Assist as needed
CDFG	Klamath Basin	Lead – All non-tribal lands, Co-Lead and technical assistance on tribal lands	NA	Technical assistance
Yurok Tribe	Yurok Tribal Lands	Co-Lead – Yurok Tribal Lands	Lead – Yurok Tribal Lands	Technical assistance
Hoopa Valley Tribe	Hoopa Valley Tribal lands	Co-Lead – Hoopa Valley Tribal lands	Lead – Hoopa Valley Tribal Lands	Technical assistance
Karuk Tribe	Karuk ancestral lands	Co-Lead – Karuk ancestral lands	Lead – Karuk ancestral lands	Technical assistance
USFWS	NA	Technical assistance	Technical assistance	Coordination
SRRC	NA	Technical assistance	NA	Technical assistance
USFS	NA	Technical assistance	Technical assistance	Technical assistance

POST EVENT ACTIVITIES

Post-event Report

After a major fish kill, the primary agency responsible for coordination will, as soon as possible, convene a post-event briefing. At this meeting, all responding agencies should be prepared to share preliminary data and information gathered during the fish kill. In addition, the group will attempt to identify the immediate factors contributing to the fish kill based on the available data.

In general, the coordinating agency will be responsible for preparation of a final report on the incident. The support agencies will be responsible for synthesis and analysis of data collected by their organizations. Each organization is strongly encouraged to participate in the preparation and review of the final report. However, each agency or organization reserves the right to provide differing opinions regarding the cause and extent of the fish kill. To the extent possible, the final report should characterize what happened, describe the environmental conditions that led to and occurred during the event, and quantify the impacts to fish and/or other resources. The report should also describe any knowledge or understanding gained as a result of the event regarding the relationship between resource management in the Klamath River Basin and fish health and/or water quality. And if emergency management actions were implemented to alleviate the fish kill, the report should include preliminary evaluation of the effectiveness of the emergency response.

Share Reports and data to aid in identification of PROACTIVE management actions

KFHAT will make available all reports and data associated with fish kills and their causative factors, so that this information may be used by decision makers to support future recommendations regarding the long-term management of resources that affect fish health in the Klamath Basin. Additionally, this data can aid in the development of science-based criteria that would trigger specific management actions and a contingency plan for future fish kills.

At present, the KFHAT does not have specific direction, support, or funding to develop mitigation recommendations in order to prevent or reduce conditions that cause fish kills in the Klamath Basin.

LITERATURE CITED

American Fisheries Society (AFS). 2003. *Investigation and Monetary Values of Fish and Freshwater Mussel Kills.* Southwick, R.I. and A.J. Loftus [eds.]. Special publication no. 30, American Fisheries Society, Washington, D.C. 177pp.

APPENDICES

APPENDIX A – Fish Enumeration Field Sheet

APPENDIX B – Water Quality Data Collection Field Sheet

APPENDIX C – USFWS Dichotomous Key for Fish Kill Investigations

APPENDIX D – Map of Klamath Basin Fish Kill Response Zones of Lead Responsibility for KFHAT

APPENDIX E – Phone Tree for RMN

APPENDIX F – Contact List for RMN

APPENDIX G – Public Posting with Notification Information for Who to Contact in the Event of a Fish Kill

APPENDIX H – Basic Incident Command System Structure

APPENDIX A

Fish Enumeration Field Sheets.

Klamath River Fish Reconnaissance Survey Data Sheet

Page: _____ **of** _____

Crew: _____

Organization: _____

Date: _____

Phone: _____

Start Air Temp: _____

Reach Des: _____

Finish Air Temp: _____

Include general observations or clarification and if photo taken underneath each record.

Rec #	Time	Location (rkm/description)	Water Temp	# Dead Chin	# Live Chin	# Sick Chin	Other Species	Observations

APPENDIX B

Water Quality Data Collection Field Sheet

KFHAT Field Data Sheet (Water Chemistry and Discrete Probe)

StationID:	Date (mm/dd/yyyy): / /	Pg of Pgs	Agency
Sample Crew:	ArrivalTime:	DepartureTime:	Sample Time (1st sample):

Field Observations

DOMINANTSUBSTRATE: Concrete,Cobble,Gravel,Sand,Mud,Other_____,unk	WADEABILITY: YES / NO	BEAUFORT SCALE (see attachment):		WIND DIRECTION (from): N W E S	**PHOTOS** (RB & LB assigned when facing downstream; RENAME to StationCode_yyyy_mm_dd_uniquecode):
SITE ODOR: None,Sulfides,Sewage,Petroleum,Mixed,Other_____	SKY CODE: Clear, Partly Cloudy, Overcast, Fog, Hazy				1: (RB / LB / BB / US / DS / ##)
OTHERPRESENCE: Vascular,Nonvascular,OilySheen,Foam,Trash,Other_____	PRECIPITATION: None, Foggy, Drizzle, Rain, Snow				
WATERODOR: None, Sulfides, Sewage, Petroleum, Mixed, Other_____	PRECIPITATION (last 24 hrs): Unknown, <1", >1", None				2: (RB / LB / BB / US / DS / ##)
WATERCLARITY: Clear (see bottom), Cloudy (>4" vis), Murky (<4" vis)	WATERCOLOR: Colorless, Green, Yellow, Brown				
OBSERVED FLOW: NA, Dry Waterbody Bed, No Observed Flow, Isolated Pool, 0.1 - 1cfs, 1 - 5 cfs, 5 - 20 cfs, 20 - 50 cfs, 50 - 200 cfs, >200cfs					3: (RB / LB / BB / US / DS / ##)
Comments:					

Sample Information

StreamDepth (m):	StreamWidth (m):		Distance from Bank (m):		Accuracy (ft / m):
EVENT TYPE: WaterTox_Chem, WaterChem, WaterTox	SAMPLE TYPE: Grab / Integrated		**Field Duplicate**: Yes/NO DupID:		
OCCUPATION METHOD: Walk-in, Bridge, Boat, Other _____	STARTING BANK: LB / RB/ NA		*GPS/DGPS	**Lat (dd.ddddd)**	**Long (dd.ddddd)**
SAMPLINGEQUIPMENT: Indiv bottle by hand, By pole, Teflon tubing, Kemmer, Pole & Beaker, Other _____			**Target:**		-
SAMPLE LOCATION: Bank, Thalweg, Midchannel, Open Water	HYDROMODLOC(to sample): US / DS / NA		**Actual:**		-
HYDROMODIFICATION: None, Bridge, Pipes, Concrete Channel, Grade Control, Culvert, Other _____			GPS Model:		Datum:

List of Samples Collected/Analyses

	*Fish Kill Suite	DepthCollec (m)	Inorganics	Bacteria	Chl a	TSS	TOC/DOC	Total Hg	Dissolved Mercury	Total Metals	Dissolved Metals	Organics	Toxicity
Sub/Surface	X												

*** See List of Analyses Attached. If samples taken do not match list please note below in "Comments" section**

Probe Measurements (Field Measurments)

	DepthCollec (m)	Velocity (fps)	Air Temp (℃)	Water Temp (℃)	pH	O_2 (mg/L)	O_2 (%)	Specific Conductivity (uS/cm)	Salinity (ppt)	Turbidity (ntu)	Stage Ht (units _____)		
SUBSURF/MID/ BOTTOM													
SUBSURF/MID/ BOTTOM													
Instrument:													
Calib. Date:													

COMMENTS:

GUIDE TO KFHAT WATER QUALITY FIELD DATA SHEETS

KEY REMINDERS:

1. **Sample Time** is the SAME for all samples (Water and probe) taken at the sample site. Use the FIRST sample as time noted on bottle, important for COC.

FIELD OBSERVATIONS:

1. **Pictures**: use space to record picture numbers given by the camera, be sure to rename the pictures and describe when you get back into the office.
2. **Wadeability**: in general, is the waterbody being sampled wadeable to the average person AT the POINT of SAMPLE.
3. **Beaufort Scale**: use scale 0-12; refer to scales listed on attached sheet "Beaufort Scale"
4. **Wind Direction**: records the direction from which the wind is blowing.
5. **Other Presence**: VASCULAR refers to terrestrial plants or submerged aquatic vegetation (SAV) and NONVASCULAR refers to plankton, periphyton etc. These definitions apply to vegetation IN the water at the immediate sampling area.
6. **Observed Flow**: Visual estimates in cubic feet/second.
7. **Water Color**: This is the color of the water from standing creek side.
8. **Water Clarity**: this describes the clarity of the water while standing creek side

SAMPLE INFORMATION:

1. **Grab vs. Integrated**: GRAB samples are when the bottles are filled from a single depth; INTEGRATED samples are taken from MULTIPLE depths and combined.
2. **Target Lat/Long**: Refers to the existing station location that the sample crew is trying to achieve; can be filled out prior to sampling.
3. **Actual Lat/Long**: is the location of the current sample event.
4. **Sample Location**: describes from where IN waterbody sample was taken; can be combined (ex: bank/thalweg or midchannel/thalweg).
5. **Stream Width, Depth**: describe in meters at point of sample.

FISH KILL SUITE:

ANALYSIS	BOTTLE TYPE /SAMPLE VOL	# CONTAINERS	PRESERVATION
Nutrient 1	1 L amber glass	1	H2SO4
Nutrient 2	1 L plastic	1	H2SO4
Nutrient 3	250 mL amber glass	1	
Full GM1	500 mL plastic	1	
Full GM2	500 mL plastic	1	
Full GM3	1 L clear glass	1	
Full GM4	250 ML amber glass	1	H2SO4
PP Mets	500 mL plastic	1	
Cr6	250 mL plastic	1	
8151A	1 L amber glass	1	
8141A	1 L amber glass	1	
8081A	1 L amber glass	1	
632	1 L amber glass	1	
547	125 mL amber glass	1	
633	1 L amber glass	1	
619	1 L amber glass	1	
8260 + TIC	40 mL amber VOA	3	HCL

BEAUFORT SCALE: SPECIFICATIONS FOR USE ON LAND

FORCE	EQUIVALENT SPEED		DESCRIPTION	SPECIFICATIONS FOR USE AT SEA
	Miles/hour	Knots		
0	0-1	0-1	Calm	Calm; smoke rises vertical.
1	1-3	1-3	Light Air	Direction of wind shown by smoke drift, but not by wind vanes.
2	4-7	4-6	Light breeze	Wind felt on face; leaves rustle; ordinary vanes moved by wind.
3	8-12	7-10	Gentle breeze	Leaves and small twigs in constant motion; wind extends light flag.
4	13-18	11-16	Moderate breeze	Raises dust and loose paper; small branches are moved.
5	19-24	17-21	Fresh breeze	Small trees in leaf begin to sway; crested wavelets form on inland waters.
6	25-31	22-27	Strong breeze	Large branches in motion; whistling heard in telegraph wires; umbrellas used with difficulty.
7	32-38	28-33	Near gale	Whole trees in motion; inconvenience felt when walking the wind.
8	39-46	34-40	Gale	Breaks twigs off trees; impedes progress.
9	47-54	41-47	Severe gale	Slight structural damage occurs chimney-pots and slates removed).
10	55-63	48-55	Storm	Seldom experienced inland; trees; considerable structural damage occurs.
11	64-72	56-63	Violent Storm	Violent Storm, very rarely experienced; accompanied by wide-spread damage
12	73-83	64-71	Hurricane	-

APPENDIX C

Dichotomous Key for Fish Kill Investigations

After the initial visual inspection of the scene, an investigator can sometimes make preliminary assumptions about the cause of a fish kill. By using a process of elimination based on the evidence at hand, certain types of causes may be highly unlikely. A dichotomous key is provided below as an example of how the thought process might proceed. This key is offered as a tool—not as a definitive reference—for assessing fish kills. Opportunities to use the key to help reach a presumptive conclusion concerning the cause of a fish kill are provided in Chapter 13. Seven case histories are described to help potential investigators test their skill in evaluating the information that became available during the on-site investigation. Although the thought process would be the same for ponds, lakes, streams, and estuaries, most of the examples used in preparing the key were taken from data on fish kills in ponds. In streams, where evidence at the site may be transitory because of the flow, the investigator may have to check downstream to attempt to reconstruct the scene.

1. Kill occurred in less than 24 hours 2
1. Not known when kill occurred, or kill continued for longer than 24 hours 16
2. Kill occurred between midnight and sunrise 3
2. Kill occurred at times other than between midnight and sunrise 8
3. Water dark in color, musty odor, or odor of sour cabbage 4
3. Water conditions normal in color and odor 6
4. Some fish alive 5
4. All fish dead 16
5. Large fish dead, some small fish alive 6
5. Small fish dead, some large fish alive 18
6. Dissolved oxygen less than 2 ppm 7
6. Dissolved oxygen 2 ppm or more 9
7. Algal cells absent or dead if present 8
7. Algal cells present and alive 10
8. Dead algal cells abundant . . . . Oxygen depletion due to enrichment
8. Algal cells absent . . . . . Oxygen depletion due to algicidal substance
9. Kill occurred between 9:00 a.m. and 5:00 p.m. 10
9. Kill occurred at other times as well 23
10. pH above 9.0 11
10. pH not above 9.0 14
11. Dissolved oxygen high, often saturated, or near saturation 12
11. Dissolved oxygen low or near normal for water temperature recorded 13
12. Heavy bloom of one or more species of blue-green algae . . . Toxic algal bloom
12. Heavy bloom of dinoflagellate algae . . . . . Toxic algal bloom
13. Vegetation dead (appears burned) 14
13. Vegetation normal 15
14. Ammonia levels not high, near zero . . 15
14. Ammonia levels high . . . . . Anhydrous ammonia spill
15. pH 6.0 to 7.0 . . . . . Oxygen depletion
15. pH below 6.0 . . . . . Possible lethal low pH or heavy metal poisoning; possible mine drainage
16. Some fish still alive 17
16. All fish dead 23
17. Kill size selective 18
17. Kill not size selective 25
18. Some small fish alive, large fish dead 6
18. Small fish dead, some large fish alive 19
19. Zooplankton and insects alive 7
19. Zooplankton and insects dead 20
20. Algal cells alive 21
20. Algal cells dead or absent . . . . . Toxic herbicidal substance
21. Fish showing convulsive or aberrant behavior 22
21. Fish seemingly normal 24
22. Fins in normal position 23
22. Pectoral fins of fish thrust to extreme forward position . . . . . Organophosphate pesticide
23. Kill occurred throughout day . . . . . Pesticide poisoning
23. Kill occurred between 9:00 a.m. and 5:00 p.m. . . . . Toxic algal bloom (see also 11)
24. Recent temporary major change in water temperature . . . . . Temperature kill (as from shutdown of thermal power generating plant or plant exceeding the allowed ΔT in discharge)

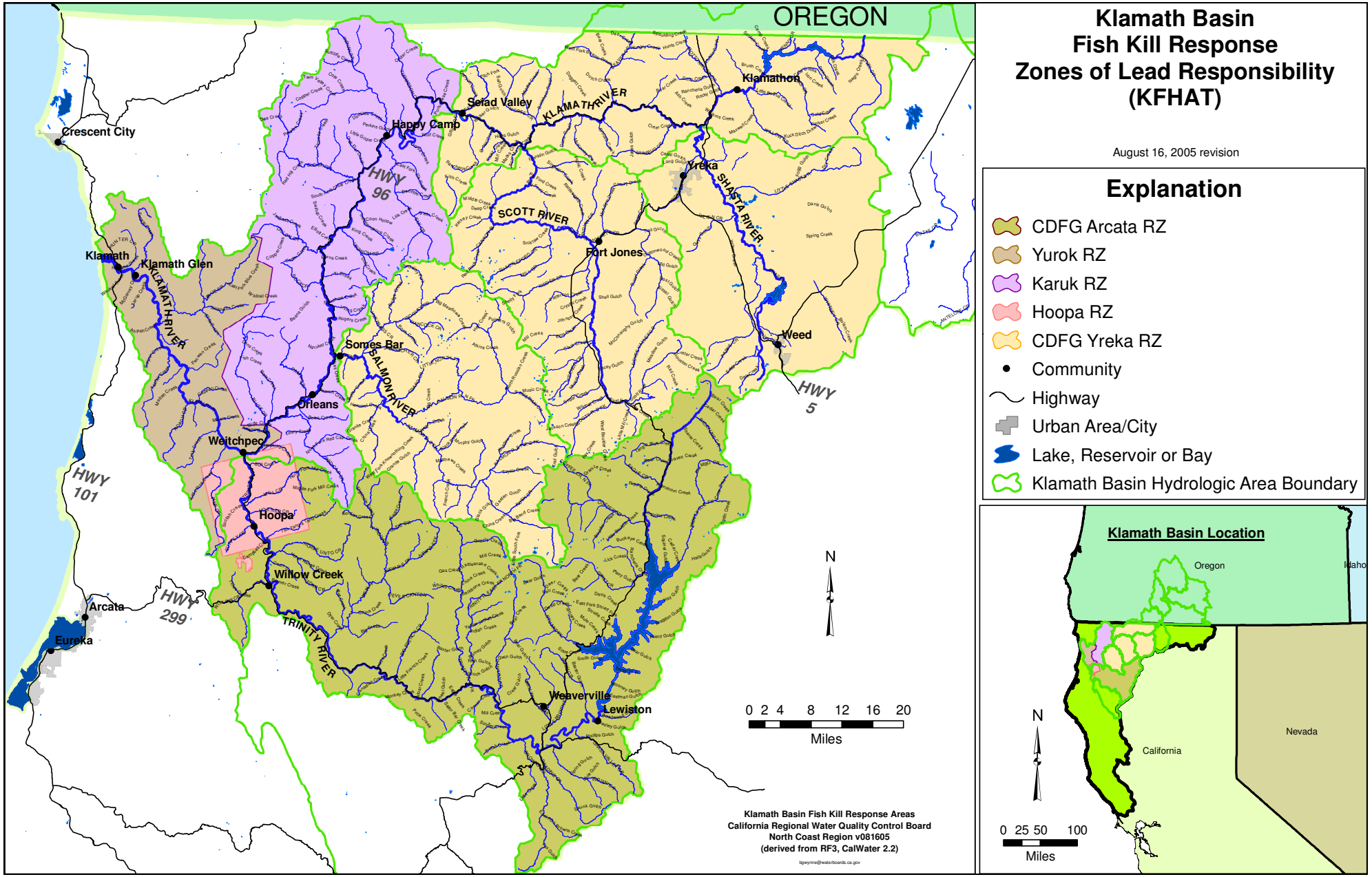
24. Normal seasonal change in water temperature ..... Temperature falls below or exceeds thermal tolerance—e.g., die-off of threadfin shad in cold weather; kill usually restricted to one species
25. Species selectivity evident 26
25. No species selectivity evident ..... Very high level of a toxic substance
26. Lesions evident on fish 27
26. No lesions on fish ..... Low toxicity or low concentration of toxic substance (see also 23)
27. Organisms in lesions visible to naked eye .. 28
27. No organisms visible 29
28. Organisms wormlike, attached to external surface of fish ..... Leeches (not a cause of death)
28. Organisms resemble copepods or have jointed body parts ..... Parasitic copepods or isopods (known to kill fish)
29. Lesions not hemorrhagic 30
29. Lesions hemorrhagic ..... Possible bacterial or viral cause
30. Lesions as small discrete bodies or masses in tissues 31
30. Lesions appear as gray, yellow, or white areas on body ..... Bacterial or fungal cause
31. Lesion or mass filled with cellular material .. Cysts caused by sporozoans, protozoans (such as *Ichthyophthirius*), or helminths
31. Lesion or mass filled with gas 32
32. Bubbles of gas present in gills, fins, and behind eyes ..... Gas bubble disease, due to supersaturation with a gas
32. Odorous gas in large bubbles in necrotic lesions ..... Bacterial disease caused by *Edwardsiella tarda*

Chronic exposure to sublethal levels of contaminants may lead to tumors or other adverse effects in surviving fish. Public concern is heightened when melanomas, papillomas, and other anomalies, such as those on this black bullhead, are seen on fish.

APPENDIX D

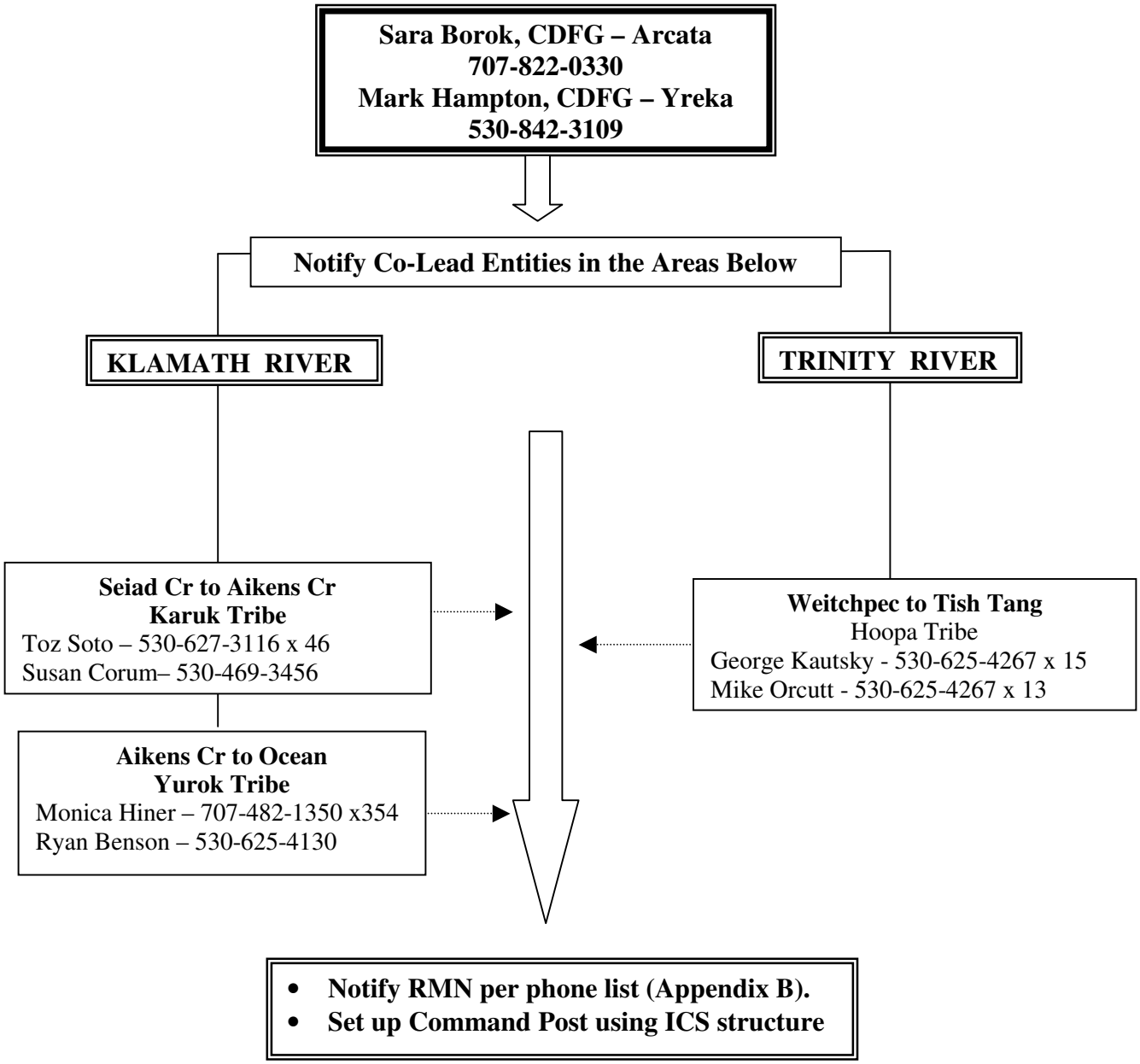
Map of Klamath Basin Fish Kill Response Zones of Lead Responsibility for KFHAT

(See file titled "FishKillResponse_Map.pdf" for an 11x17 version of this map)


OREGON
Crescent City
Happy Camp
Seiad Valley
Klamathon
KLAMATH RIVER
HWY 96
SCOTT RIVER
Yreka
SHASTA RIVER
Fort Jones
Klamath
Klamath Glen
KLAMATH RIVER
Somes Bar
SALMON RIVER
Weed
HWY 5
Orleans
Weitchpec
HWY 101
Hoopa
Willow Creek
Arcata
HWY 299
Eureka
TRINITY RIVER
Weaverville
Lewiston
N
0 2 4 8 12 16 20
Miles
Klamath Basin Fish Kill Response Areas
California Regional Water Quality Control Board
North Coast Region v081605
(derived from RF3, CalWater 2.2)
tgwynne@waterboards.ca.gov
Klamath Basin
Fish Kill Response
Zones of Lead Responsibility
(KFHAT)
August 16, 2005 revision
Explanation
CDFG Arcata RZ
Yurok RZ
Karuk RZ
Hoopa RZ
CDFG Yreka RZ
Community
Highway
Urban Area/City
Lake, Reservoir or Bay
Klamath Basin Hydrologic Area Boundary
Klamath Basin Location
Oregon
Idaho
Nevada
California
N
0 25 50 100
Miles

APPENDIX E

Phone Tree for RMN



APPENDIX F

Contact List for RMN

1. North Coast RWQCB - **Coordination** of **Water Quality Monitoring**, analytical laboratory support. 24 hr office pager, 707-323-4945, main office number for paging people 707-576-2290.
   - Katharine Carter 707-576-2290, kcarter@waterboards.ca.gov
   - Peter Otis 707-576-2662, potis@waterboards.ca.gov

2. CDFG - **Lead Coordinator** for overall response in the basin and serve as Co-Lead Coordinator with the appropriate Tribe on all Tribal lands.
   - Sara Borok 707-822-0330, sborok@dfg.ca.gov (Klamath River and tribs upstream of Seiad Creek)
   - Mark Hampton 530-842-3109, MHampton@dfg.ca.gov (Klamath River and tribs upstream of Seiad Creek)
   - Wade Sinnen 707-822-5119, wsinnen@dfg.ca.gov (Trinity River and tribs upstream of Tish Tang Creek)

3. Hoopa Valley Tribe – Co-Lead **Coordinator** for overall response in **Hoopa Tribal lands** (Trinity River and Tributaries from Weitchpec to Tish Tang Creek), WQ monitoring, carcass enumeration
   - George Kautsky - 530-625-4267 x15, hupafish@pcweb.net
   - Mike Orcutt - 530-625-4267 x13, director@pcweb.net

4. Yurok Tribe – Co-**Lead Coordinator** for overall response in **Yurok Tribal lands** (Klamath River and Tributaries from Pacific Ocean to Aikens Creek), WQ monitoring, carcass enumeration. Yurok Dept. of Public Safety in Klamath 707-482-8185
   - Monica Hiner (Tribal Env. Prog) - 707-482-1350 ext 354; 707-954-8259 (cell), mhiner@yuroktribe.nsn.us
   - Ryan Benson (fisheries) 530-625-4130 (office) 707-498-1074 (cell), ryanlbenson@hotmail.com
   - Ken Fetcho (water quality) – 707-482-1350 x351, kfetcho@yuroktribe.nsn.us
   - Kevin McKernan (water quality) – 707-482-1350 x355 (office), Kevin@yuroktribe.nsn.us

5. Karuk Tribe- Co-**Lead Coordinator** for overall response in **Karuk Ancestral Tribal lands** (Klamath River and tributaries from Aikens Creek to Seiad Creek), WQ monitoring, carcass enumeration
   - Toz Soto - 530-627-3116 x46, tsoto@karuk.us
   - Ron Reed - 530-627-3446 x24, rreed@karuk.us
   - Susan Corum – 530-469-3456, scorum@karuk.us

6. Quartz Valley Indian Tribe - Field support as needed
   - Rebeka Sluss – 530-468-5907, rebkahquir@yahoo.com

7. US Bureau of Reclamation (USBOR) – Technical assistance, hydrology
   - Cindy Williams, Klamath Falls-541-880-2585 (direct) 541-883-6935 (main office),

cwilliams@mp.usbr.gov
- Ron Costello, Klamath Falls-541-880-2556 (direct), rcostello@mp.usbr.gov

8. US Fish and Wildlife Service (USFWS) - **Coordination** of **Fish Health Monitoring**, technical and field support for WQ monitoring and carcass enumeration on Tribal and Non-Tribal lands. Arcata Fish and Wildlife Office (AFWO): 707-822-7201
   - Mike Long, AFWO Field Supervisor – 707-822-7201, micheal_long@fws.gov
   - Paul Zedonis-707-825-5119, paul_zedonis@fws.gov
   - Charlie Chamberlain- 707-825-5110, charles_chamberlain@fws.gov

9. Oregon Department of Fish and Wildlife (ODFW)
   - Roger Smity, 541-883-5723, roger.c.smity@state.or.us

10. NOAA Fisheries - Technical Support
    - Jim Simondet – 707-825-5171, jim.simondet@noaa.gov
    - Rick Rogers – 707-825-5167

11. US Forest Service (USFS) - Technical Support
    - Anita Andazola - Lower Trinity Ranger District – 530-629-2118 x 319 (w), 530-629-3757 (h); aandazola@fs.fed.us
    - Jon Grunbaum – Happy Camp – 530-493-1719, jgrunbaum@fs.fed.us
    - LeRoy Cyr-530-627-3291, lcyr@fs.fed.us

12. Environmental Protection Agency (EPA) – Technical and laboratory support as needed
    - Suesan Saucerman – 415-972-3522; saucerman.suesan@epa.gov

13. California Department of Water Resources (DWR) – Hydrology as needed
    - Curtis Anderson – 530-529-7348; curtis@water.ca.gov

14. PacifiCorp – Field support, hydrology as needed
    - Linda Prendergast – 503-813-6625; linda.prendergast@pacificorp.com

15. Klamath Salmon Anglers and Guides Association – assistance as needed
    - Wally Watson (Klamath R. Outfitters) – 530-469-3349

17. Salmon River Restoration Council- Assistance in Salmon River and Mid Klamath River
    - Petey Brucker – 530-462-4665, 530-598-4669 (cell), pbrucker@srrc.org
    - Jim Villeponteaux – 530-462-4665, jvptx@srrc.org
    - Nat Pennington – 530-623-0883

18. Other Useful Numbers
    - California Highway Patrol Dispatch, Yreka – 530-841-6000
    - California Highway Patrol, Humboldt Area – (707) 822-5981
    - National Response Center (for Hazardous material spills) 800-424-8802
    - EPA Emergency Response Duty Officer (for Hazardous material spills) 800-300-2193
    - Office of Spill Prevention and Response (for Hazardous material spills) 916-445-9338

APPENDIX G

Public Posting With Notification Information For Whom to Contact in the Event of a Fish Kill

Attention:
Community Members of the Klamath Basin

Please report occurrences of numerous dead or sick fish in the Klamath River and its tributaries!!!

Large fish kill events occurred in the Klamath River during the summer months of 2000 (juvenile salmon),and 2002 (adult salmon). State, federal, private, and Tribal organizations have assembled a Klamath Fish Health Assessment Team (KFHAT) to assess and monitor river conditions and fish health in the Klamath Basin. KFHAT members have been trained to respond to fish kill events.

We would greatly appreciate local citizens, organizations, and agencies notifying us if you believe you may be witnessing a fish kill event. Fish kills typically occur in short periods of time and can result in high numbers of sick and dead fish. Fish kills can occur from a variety of causes, including disease and toxic chemicals. Quick response by trained people is important. **Individuals are cautioned not to attempt to examine fish or put themselves in harm's way during a fish kill event.**

Sick fish generally congregate at creek mouths and other coldwater refugia areas during stressful periods. Dead fish generally accumulate in eddy and backwater areas.

Call KFHAT. We will respond to the fish kill.

Please report any observations of large numbers of dead or dying fish to CalTip at the tollfree number below. Press "3" to talk to an attendant.

1-888-334-2258

Attention:
Community Members of the Trinity River

Please report occurrences of numerous dead or sick fish in the Trinity River and its tributaries!!!

Large fish kill events occurred in the Klamath River during the summer months of 2000 (juvenile salmon),and 2002 (adult salmon). State, federal, private, and Tribal organizations have assembled a Klamath Fish Health Assessment Team (KFHAT) to assess and monitor river conditions and fish health in the Klamath Basin. KFHAT members have been trained to respond to fish kill events.

We would greatly appreciate local citizens, organizations, and agencies notifying us if you believe you may be witnessing a fish kill event. Fish kills typically occur in short periods of time and can result in high numbers of sick and dead fish. Fish kills can occur from a variety of causes, including disease and toxic chemicals. Quick response by trained people is important. **Individuals are cautioned not to attempt to examine fish or put themselves in harm's way during a fish kill event.**

Sick fish generally congregate at creek mouths and other coldwater refugia areas during stressful periods. Dead fish generally accumulate in eddy and backwater areas.

Call KFHAT. We will respond to the fish kill.

Please report any observations of large numbers of dead or dying fish to CalTip at the tollfree number below. Press "3" to talk to an attendant.

1-888-334-2258

APPENDIX H

Basic Incident Command System Structure

(Can be expanded or contracted to fit the response need…dashed lines).